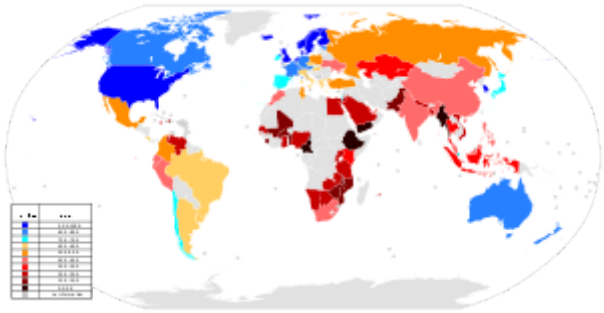
WIKIPEDIA

World Wide Web

The **World Wide Web** (**WWW**), commonly known as **the Web**, is an information space where documents and other web resources are identified by Uniform Resource Locators (URLs, such as *https://www.example.com/*), which may be interlinked by hypertext, and are accessible over the Internet.[1] The resources of the WWW may be accessed by users by a software application called a *web browser*.

A web page can be displayed using a web browser Web browsers often highlight and underline hypertext links and web pages can contain images.

English scientist Tim Berners-Lee invented the World Wide Web in 1989. He wrote the first web browser in 1990 while employed at CERN near Geneva, Switzerland.[2][3] The browser was released outside CERN in 1991, first to other research institutions starting in January 1991 and then to the general public in August 1991. The World Wide Web has been central to the development of the Information Age and is the primary tool billions of people use to interact on the Internet.[4][5][6]



A global map of theweb index for countries in 2014

Web resources may be any type of downloaded media, but *web pages* are hypertext media that have been formatted in Hypertext Markup Language (HTML).[7] Such formatting allows for embedded hyperlinks that contain URLs and permit users to navigate to other web resources. In addition to text, web pages may contain images, video, audio, and software components that are rendered in the user's web browser as coherent pages ofmultimedia content.

Multiple web resources with a common theme, a common domain name, or both, make up a website. Websites are stored in computers that are running a program called a web server that responds to requests made over the Internet from web browsers running on a user's computer. Website content can be largely provided by a publisher, or interactively where users contribute content or the content depends upon the users or their actions. Websites may be provided for a myriad of informative, entertainment, commercial, governmental, or non-governmental reasons.

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History

Tim Berners-Lee's vision of a global hyperlinked information system became a possibility by the second half of the 1980s.[8] By 1985, the global Internet began to proliferate in Europe and the Domain Name System (upon which the Uniform Resource Locator is built) came into being. In 1988 the first direct IP connection between Europe and North America was made and Berners-Lee began to openly discuss the possibility of a web-like system at CERN.[9]

The NeXT Computer used by Tim Berners-Lee at CERN.

While working at CERN, Berners-Lee became frustrated with the inefficiencies and difficulties posed by finding information stored on different computers.[10] On March 12, 1989, he submitted a memorandum, titled "Information Management: A Proposal",[11] to the management at CERN for a system called "Mesh" that referenced ENQUIRE, a database and software project he had built in 1980, which used the term "web" and described a more elaborate information management system based on links embedded as text: "Imagine, then, the references in this document all being associated with the network address of the thing to which they referred, so that while reading this document, you could skip to them with a click of the mouse." Such a system, he explained, could be referred to using one of the existing meanings of the word *hypertext*, a term that he says was coined in the 1950s. There is no reason, the proposal continues, why such hypertext links could not encompass multimedia documents including graphics, speech and video, so that Berners-Lee goes on to use the term *hypermedia*.[12]

The corridor where WWW was born. CERN, ground floor of building No.1

With help from his colleague and fellow hypertext enthusiast Robert Cailliau he published a more formal proposal on 12 November 1990 to build a "Hypertext project" called "WorldWideWeb" (one word) as a "web" of "hypertext documents" to be viewed by "browsers" using a client–server architecture.[13] At this point HTML and HTTP had already been in development for about two months and the first Web server was about a month from completing its first successful test. This proposal estimated that a read-only web would be developed within three months and that it would take six months to achieve "the creation of new links and new material by readers, [so that] authorship becomes universal" as well as "the automatic notification of a reader when new material of interest to him/her has become available". While the read-only goal was met, accessible authorship of web content took longer to mature, with the wiki concept, WebDAV, blogs, Web 2.0 and RSS/Atom.[14]

The proposal was modelled after the SGML reader Dynatext by Electronic Book Technology, a spin-off from the Institute for Research in Information and Scholarship at Brown University. The Dynatext system, licensed by CERN, was a key player in the extension of SGML ISO 8879:1986 to Hypermedia within HyTime, but it was considered too expensive and had an inappropriate licensing policy for use in the general high energy physics community, namely a fee for each document and each document alteration. A NeXT Computer was used by Berners-Lee as the world's first web server and also to write the first web browser, WorldWideWeb, in 1990. By Christmas 1990, Berners-Lee had built all the tools necessary for a working Web:[15] the first web browser (which was a web editor as well) and the first web server. The first web site,[16] which described the project itself, was published on 20 December 1990.[17]

The CERN data centre in 2010 housing some WWW servers

The first web page may be lost, but Paul Jones of UNC-Chapel Hill in North Carolina announced in May 2013 that Berners-Lee gave him what he says is the oldest known web page during a 1991 visit to UNC. Jones stored it on a magneto-optical drive and on his NeXT computer.[18] On 6 August 1991, Berners-Lee published a short summary of the World Wide Web project on the newsgroup *alt.hypertext*.[19] This date is sometimes confused with the public availability of the first web servers, which had occurred months earlier. As another example of such confusion, several news media reported that the first photo on the Web was published by Berners-Lee in 1992, an image of the CERN house band Les Horribles Cernettes taken by Silvano de Gennaro; Gennaro has disclaimed this story, writing that media were "totally distorting our words for the sake of cheap sensationalism".[20]

The first server outside Europe was installed at the Stanford Linear Accelerator Center (SLAC) in Palo Alto, California, to host the SPIRES-HEP database. Accounts differ substantially as to the date of this event. The World Wide Web Consortium's timeline says December 1992,[21] whereas SLAC itself claims December 1991,[22][23] as does a W3C document titled *A Little History of the World Wide Web*.[24] The underlying concept of hypertext originated in previous projects from the 1960s, such as the Hypertext Editing System (HES) at Brown University, Ted Nelson's Project Xanadu, and Douglas Engelbart's oN-Line System (NLS). Both Nelson and Engelbart were in turn inspired by Vannevar Bush's microfilm-based *memex*, which was described in the 1945 essay "As We May Think".[25]

Berners-Lee's breakthrough was to marry hypertext to the Internet. In his book *Weaving The Web*, he explains that he had repeatedly suggested that a marriage between the two technologies was possible to members of *both* technical communities, but when no one took up his invitation, he finally assumed the project himself. In the process, he developed three essential technologies:

- a system of globally unique identifiers for resources on the Web and elsewhere, the universal document identifier (UDI), later known as uniform resource locator (URL) and uniform resource identifier (URI);
- the publishing language Hypertext Markup Language (HTML);
- the Hypertext Transfer Protocol (HTTP).[26]

The World Wide Web had several differences from other hypertext systems available at the time. The Web required only unidirectional links rather than bidirectional ones, making it possible for someone to link to another resource without action by the owner of that resource. It also significantly reduced the difficulty of implementing web servers and browsers (in comparison to earlier systems), but in turn presented the chronic problem of *link rot*. Unlike predecessors such as HyperCard, the World Wide Web was non-proprietary, making it possible to develop servers and clients independently and to add extensions without licensing restrictions. On 30 April 1993, CERN announced that the World Wide Web would be free to anyone, with no fees due.[27] Coming two months after the announcement that the server implementation of the Gopher protocol was no longer free to use, this produced a rapid shift away from Gopher and towards the Web. An early popular web browser was ViolaWWW for Unix and the X Window System.

Scholars generally agree that a turning point for the World Wide Web began with the introduction[28] of the Mosaic web browser[29] in 1993, a graphical browser developed by a team at the National Center for Supercomputing Applications at the University of Illinois at Urbana–Champaign (NCSA-UIUC), led by Marc Andreessen. Funding for Mosaic came from the US High-Performance Computing and Communications Initiative and the High Performance Computing Act of 1991, one of several computing developments initiated by US Senator Al Gore.[30] Prior to the release of Mosaic, graphics were not commonly mixed with text in

web pages and the web's popularity was less than that of older protocols in use over the Internet, such as Gopher and Wide Area Information Servers (WAIS). Mosaic's graphical user interface allowed the Web to become, by far, the most popular Internet protocol. The World Wide Web Consortium (W3C) was founded by Tim Berners-Lee after he left the European Organization for Nuclear Research (CERN) in October 1994. It was founded at the Massachusetts Institute of Technology Laboratory for Computer Science (MIT/LCS) with support from the Defense Advanced Research Projects Agency (DARPA), which had pioneered the Internet; a year later, a second site was founded at INRIA (a French national computer research lab) with support from the European Commission DG InfSo; and in 1996, a third continental site was created in Japan at Keio University. By the end of 1994, the total number of websites was still relatively small, but many notable websites were already active that foreshadowed or inspired today's most popular services.

Robert Cailliau, Jean-François Abramatic, and Tim Berners-Lee at the 10th anniversary of the World Wide Web Consortium.

Connected by the Internet, other websites were created around the world. This motivated international standards development for protocols and formatting. Berners-Lee continued to stay involved in guiding the development of web standards, such as the markup languages to compose web pages and he advocated his vision of a Semantic Web. The World Wide Web enabled the spread of information over the Internet through an easy-to-use and flexible format. It thus played an important role in popularising use of the Internet.[31] Although the two terms are sometimes conflated in popular use, *World Wide Web* is not synonymous with *Internet*.[32] The Web is an information space containing hyperlinked documents and other resources, identified by their URIs.[33] It is implemented as both client and server software using Internet protocols such as TCP/IP and HTTP. Berners-Lee was knighted in 2004 by Queen Elizabeth II for "services to the global development of the Internet".[34][35] He never patented his invention.

Function

The terms *Internet* and *World Wide Web* are often used without much distinction. However, the two terms do not mean the same thing. The Internet is a global system of interconnected computer networks. In contrast, the World Wide Web is a global collection of documents and other resources, linked by hyperlinks and URIs. Web resources are accessed using HTTP or HTTPS, which are application-level Internet protocols that use the Internet's transport protocols.[36]

The World Wide Web functions as an application layer protocol that is run "on top of" (figuratively) the Internet, helping to make it more functional. The advent of the Mosaic web browser helped to make the web much more usable, to include the display of images and moving images (GIFs).

Viewing a web page on the World Wide Web normally begins either by typing the URL of the page into a web browser, or by following a hyperlink to that page or resource. The web browser then initiates a series of background communication messages to fetch and display the requested page. In the 1990s, using a browser to view web pages—and to move from one web page to another through hyperlinks—came to be known as 'browsing,' 'web surfing' (after channel surfing), or 'navigating the Web'. Early studies of this new behaviour investigated user patterns in using web browsers. One study, for example, found five user patterns: exploratory surfing, window surfing, evolved surfing, bounded navigation and targeted navigation.[37]

The following example demonstrates the functioning of a web browser when accessing a page at the URL `http://www.example.org/home.html` The browser resolves the server name of the URL (`www.example.org`) into an Internet Protocol address using the globally distributed Domain Name System (DNS). This lookup returns an IP address such as *203.0.113.4* or *2001:db8:2e::7334*. The browser then requests the resource by sending an HTTP request across the Internet to the computer at that address. It requests service from a specific TCP port number that is well known for the HTTP service, so that the receiving host can distinguish an HTTP request from other network protocols it may be servicing. The HTTP protocol normally uses port number 80 and for HTTPS protocol it normally is port number 443. The content of the HTTP request can be as simple as two lines of text:

```
GET /home.html HTTP/1.1
Host: www.example.org
```

The computer receiving the HTTP request delivers it to web server software listening for requests on port 80. If the web server can fulfil the request it sends an HTTP response back to the browser indicating success:

```
HTTP/1.1 200 OK
Content-Type: text/html; charset=UTF-8
```

followed by the content of the requested page. HyperText Markup Language (HTML) for a basic web page might look like this:

```
<html>
  <head>
    <title>www.Example.org – The World Wide Web </title>
  </head>
  <body>
    <p>The World Wide Web, abbreviated as WWW and commonly known ...  </p>
  </body>
</html>
```

The web browser parses the HTML and interprets the markup (`<title>`, `<p>` for paragraph, and such) that surrounds the words to format the text on the screen. Many web pages use HTML to reference the URLs of other resources such as images, other embedded media, scripts that affect page behaviour, and Cascading Style Sheets that affect page layout. The browser makes additional HTTP requests to the web server for these other Internet media types. As it receives their content from the web server, the browser progressively renders the page onto the screen as specified by its HTML and these additional resources.

HTML

Hypertext Markup Language (HTML) is the standard markup language for creating web pages and web applications. With Cascading Style Sheets (CSS) and JavaScript, it forms a triad of cornerstone technologies for the World Wide Web.[38]

Web browsers receive HTML documents from a web server or from local storage and render the documents into multimedia web pages. HTML describes the structure of a web page semantically and originally included cues for the appearance of the document.

HTML elements are the building blocks of HTML pages. With HTML constructs, images and other objects such as interactive forms may be embedded into the rendered page. HTML provides a means to create structured documents by denoting structural semantics for text such as headings, paragraphs, lists, links, quotes and other items. HTML elements are delineated by *tags*, written using angle brackets. Tags such as `<img />` and `<input />` directly introduce content into the page. Other tags such as `<p>` surround and provide information about document text and may include other tags as sub-elements. Browsers do not display the HTML tags, but use them to interpret the content of the page.

HTML can embed programs written in a scripting language such as JavaScript, which affects the behavior and content of web pages. Inclusion of CSS defines the look and layout of content. The World Wide Web Consortium (W3C), maintainer of both the HTML and the CSS standards, has encouraged the use of CSS over explicit presentational HTML since 1997.[39]

Linking

Most web pages contain hyperlinks to other related pages and perhaps to downloadable files, source documents, definitions and other web resources. In the underlying HTML, a hyperlink looks like this: `<a href="http://www.example.org/home.html">www.Example.org Homepage</a>`

Such a collection of useful, related resources, interconnected via hypertext links is dubbed a *web* of information. Publication on the Internet created what Tim Berners-Lee first called the *WorldWideWeb* (in its original CamelCase, which was subsequently discarded) in November 1990.[13]

The hyperlink structure of the WWW is described by the webgraph: the nodes of the web graph correspond to the web pages (or URLs) the directed edges between them to the hyperlinks. Over time, many web resources pointed to by hyperlinks disappear, relocate, or are replaced with different content. This makes hyperlinks obsolete, a phenomenon referred to in some circles as link rot, and the hyperlinks affected by it are often called dead links. The ephemeral nature of the Web has prompted many efforts to archive web sites. The Internet Archive, active since 1996, is the best known of such efforts.

Graphic representation of a minute fraction of the WWW, demonstrating hyperlinks

WWW prefix

Many hostnames used for the World Wide Web begin with *www* because of the long-standing practice of naming Internet hosts according to the services they provide. The hostname of a web server is often *www*, in the same way that it may be *ftp* for an FTP server, and *news* or *nntp* for a Usenet news server. These host names appear as Domain Name System (DNS) or subdomain names, as in *www.example.com*. The use of *www* is not required by any technical or policy standard and many web sites do not use it; the first web server was *nxoc01.cern.ch*.[40] According to Paolo Palazzi,[41] who worked at CERN along with Tim Berners-Lee, the popular use of *www* as subdomain was accidental; the World Wide Web project page was intended to be published at www.cern.ch while info.cern.ch was intended to be the CERN home page, however the DNS records were never switched, and the practice of prepending *www* to an institution's website domain name was subsequently copied. Many established websites still use the prefix, or they employ other subdomain names such as *www2*, *secure* or *en* for special purposes. Many such web servers are set up so that both the main domain name (e.g., example.com) and the *www* subdomain (e.g., www.example.com) refer to the same site; others require one form or the other, or they may map to different web sites. The use of a subdomain name is useful for load balancing incoming web traffic by creating a CNAME record that points to a cluster of web servers. Since, currently, only a subdomain can be used in a CNAME, the same result cannot be achieved by using the bare domain root.[42]

When a user submits an incomplete domain name to a web browser in its address bar input field, some web browsers automatically try adding the prefix "www" to the beginning of it and possibly ".com", ".org" and ".net" at the end, depending on what might be missing. For example, entering 'microsoft' may be transformed to *http://www.microsoft.com/* and 'openoffice' to *http://www.openoffice.org*. This feature started appearing in early versions of Firefox, when it still had the working title 'Firebird' in early 2003, from an earlier practice in browsers such as Lynx.[43] It is reported that Microsoft was granted a US patent for the same idea in 2008, but only for mobile devices.[44]

In English, *www* is usually read as *double-u double-u double-u*.[45] Some users pronounce it *dub-dub-dub*, particularly in New Zealand. Stephen Fry, in his "Podgrams" series of podcasts, pronounces it *wuh wuh wuh*.[46] The English writer Douglas Adams once quipped in *The Independent on Sunday* (1999): "The World Wide Web is the only thing I know of whose shortened form takes three times longer to say than what it's short for".[47] In Mandarin Chinese, *World Wide Web* is commonly translated via a phono-semantic matching to *wàn wéi wǎng* (万维网), which satisfies *www* and literally means "myriad dimensional net",[48] a translation that reflects the design concept and proliferation of the World Wide Web. Tim Berners-Lee's web-space states that *World Wide Web* is officially spelled as three separate words, each capitalised, with no intervening hyphens.[49] Use of the www prefix has been declining, especially when Web 2.0 web applications sought to brand their domain names and make them easily pronounceable.[50] As the mobile Web grew in popularity, services like Gmail.com, Outlook.com, Myspace.com, Facebook.com and Twitter.com are most often mentioned without adding "www" (or, indeed, ".com") to the domain.

Scheme specifiers

The scheme specifiers `http://` and `https://` at the start of a web URI refer to Hypertext Transfer Protocol or HTTP Secure, respectively. They specify the communication protocol to use for the request and response. The HTTP protocol is fundamental to the operation of the World Wide Web, and the added encryption layer in HTTPS is essential when browsers send or retrieve confidential data, such as passwords or banking information. Web browsers usually automatically prepend http:// to user-entered URIs, if omitted.

Web page

A *web page* (also written as *webpage*) is a document that is suitable for the World Wide Web and web browsers. A web browser displays a web page on a monitor or mobile device.

The term *web page* usually refers to what is visible, but may also refer to the contents of the computer file itself, which is usually a text file containing hypertext written in HTML or a comparable markup language. Typical web pages provide hypertext for browsing to other web pages via hyperlinks, often referred to as *links*. Web browsers will frequently have to access multiple web resource elements, such as reading style sheets, scripts, and images, while presenting each web page.

On a network, a web browser can retrieve a web page from a remote web server. The web server may restrict access to a private network such as a corporate intranet. The web browser uses the Hypertext Transfer Protocol (HTTP) to make such requests to the web server.

A *static* web page is delivered exactly as stored, as web content in the web server's file system. In contrast, a *dynamic* web page is generated by a web application, usually driven by server-side software. Dynamic web pages help the browser (the client) to enhance the web page through user input to the server

A screenshot of a web page on Wikimedia Commons

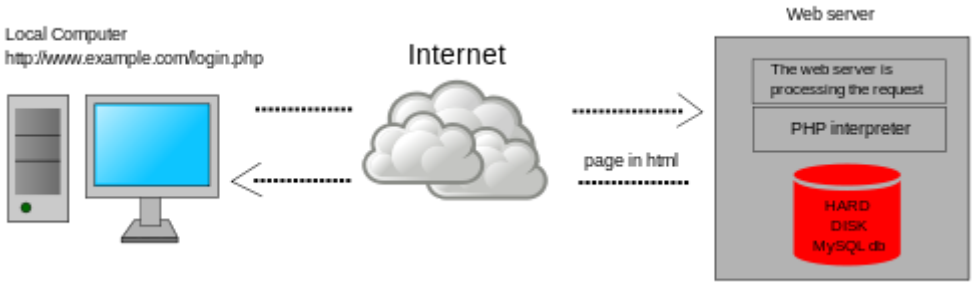
Static web page

A *static web page* (sometimes called a *flat page/stationary page*) is a web page that is delivered to the user exactly as stored, in contrast to dynamic web pages which are generated by a web application.

Consequently, a static web page displays the same information for all users, from all contexts, subject to modern capabilities of a web server to negotiate content-type or language of the document where such versions are available and the server is configured to do so.

Dynamic web pages

A *server-side dynamic web page* is a web page whose construction is controlled by an application server processing server-side scripts. In server-side scripting, parameters determine how the assembly of every new web page proceeds, including the setting up of more client-side processing.



Dynamic web page: example of server-side scripting (PHP and MySQL).

A *client-side dynamic web page* processes the web page using HTML scripting running in the browser as it loads. JavaScript and other scripting languages determine the way the HTML in the received page is parsed into the Document Object Model, or DOM, that represents the loaded web page. The same client-side techniques can then dynamically update or change the DOM in the same way.

A dynamic web page is then reloaded by the user or by a computer program to change some variable content. The updating information could come from the server, or from changes made to that page's DOM. This may or may not truncate the browsing history or create a saved version to go back to, but a *dynamic web page update* using Ajax technologies will neither create a page to go back to, nor truncate the web browsing history forward of the displayed page. Using Ajax technologies the end user gets *one dynamic page* managed as a single page in the web browser while the actual web content rendered on that page can vary. The Ajax engine sits only on the browser requesting parts of its DOM, *the* DOM, for its client, from an application server

DHTML is the umbrella term for technologies and methods used to create web pages that are not static web pages, though it has fallen out of common use since the popularization of AJAX, a term which is now itself rarely used. Client-side-scripting, server-side scripting, or a combination of these make for the dynamic web experience in a browser

JavaScript is a scripting language that was initially developed in 1995 by Brendan Eich, then of Netscape, for use within web pages.[51] The standardised version is ECMAScript.[51] To make web pages more interactive, some web applications also use JavaScript techniques such as Ajax (asynchronous JavaScript and XML). Client-side script is delivered with the page that can make additional HTTP requests to the server, either in response to user actions such as mouse movements or clicks, or based on elapsed time. The server's responses are used to modify the current page rather than creating a new page with each response, so the server needs only to provide limited, incremental information. Multiple Ajax requests can be handled at the same time, and users can interact with the page while data is retrieved. Web pages may also regularly poll the server to check whether new information is available.[52]

Website

A *website*[53] is a collection of related web resources including web pages, multimedia content, typically identified with a common domain name, and published on at least one web server. Notable examples are wikipedia.org, google.com, and amazon.com.

A website may be accessible via a public Internet Protocol (IP) network, such as the Internet, or a private local area network (LAN), by referencing a uniform resource locator (URL) that identifies the site.

Websites can have many functions and can be used in various fashions; a website can be a personal website, a corporate website for a company, a government website, an organization website, etc. Websites are typically dedicated to a particular topic or purpose, ranging from entertainment and social networking to providing news and education. All publicly accessible websites collectively constitute the World Wide Web, while private websites, such as a company's website for its employees, are typically a part of an intranet.

Web pages, which are the building blocks of websites, are documents, typically composed in plain text interspersed with formatting instructions of Hypertext Markup Language (HTML, XHTML). They may incorporate elements from other websites with suitable markup anchors. Web pages are accessed and transported with the Hypertext Transfer Protocol (HTTP), which may optionally employ encryption (HTTP Secure, HTTPS) to provide security and privacy for the user. The user's application, often a web browser, renders the page content according to its HTML markup instructions onto a display terminal.

The usap.gov website

Hyperlinking between web pages conveys to the reader the site structure and guides the navigation of the site, which often starts with a home page containing a directory of the site web content. Some websites require user registration or subscription to access content. Examples of subscription websites include many business sites, news websites, academic journal websites, gaming websites, file-sharing websites,

message boards, web-based email, social networking websites, websites providing real-time stock market data, as well as sites providing various other services.End users can access websites on a range of devices, including desktop and laptop computers, tablet computers, smartphones and smart TVs.

Web browser

A *web browser* (commonly referred to as a *browser*) is a software user agent for accessing information on the World Wide Web. To connect to a website's server and display its pages, a user needs to have a web browser program. This is the program that the user runs to download, format and display a web page on the user's computer.[54]

In addition to allowing users to find, displaying and moving between web pages, a web browser will usually have features like keeping bookmarks, recording history, managing cookies (see below) and home pages and may have facilities for recording passwords for logging into web sites.

The most popular browsers areChrome, Firefox, Safari, Internet Explorer, and Edge.

Web server

A *Web server* is server software, or hardware dedicated to running said software, that can satisfy World Wide Web client requests. A web server can, in general, contain one or more websites. A web server processes incoming network requests over HTTP and several other related protocols.[55]

The inside and front of aDell PowerEdge web server, a computer designed for rack mounting

The primary function of a web server is to store, process and deliver web pages to clients.[56] The communication between client and server takes place using the Hypertext Transfer Protocol (HTTP). Pages delivered are most frequently HTML documents, which may includeimages, style sheets and scripts in addition to the text content.

A user agent, commonly a web browser or web crawler, initiates communication by making a request for a specific resource using HTTP and the server responds with the content of that resource or an error message if unable to do so. The resource is typically a real file on the server's secondary storage, but this is not necessarily the case and depends on how the web server is implemented.

Multiple web servers may be used for a high traffic website; here, Dell servers are installed together being used for theWikimedia Foundation.

While the primary function is to serve content, a full implementation of HTTP also includes ways of receiving content from clients. This feature is used for submittingweb forms, including uploading of files.

Many generic web servers also support server-side scripting using Active Server Pages (ASP), PHP (Hypertext Preprocessor), or other scripting languages. This means that the behaviour of the web server can be scripted in separate files, while the actual server software remains unchanged. Usually, this function is used to generate HTML documents dynamically ("on-the-fly") as opposed to returning static documents. The former is primarily used for retrieving or modifying information from databases. The latter is typically much faster and more easily cached but cannot deliverdynamic content.

Web servers can also frequently be found embedded in devices such as printers, routers, webcams and serving only a local network. The web server may then be used as a part of a system for monitoring or administering the device in question. This usually means that no additional software has to be installed on the client computer since only a web browser is required (which now is included

with most operating systems).

HTTP (web) cookie

An *HTTP cookie* (also called *web cookie*, *Internet cookie*, *browser cookie*, or simply *cookie*) is a small piece of data sent from a website and stored on the user's computer by the user's web browser while the user is browsing. Cookies were designed to be a reliable mechanism for websites to remember stateful information (such as items added in the shopping cart in an online store) or to record the user's browsing activity (including clicking particular buttons, logging in, or recording which pages were visited in the past). They can also be used to remember arbitrary pieces of information that the user previously entered into form fields such as names, addresses, passwords, and credit card numbers.

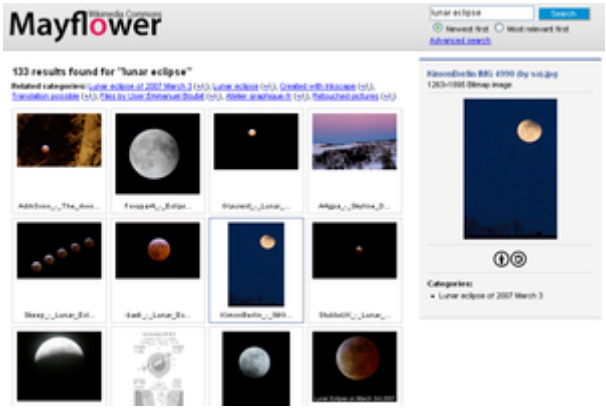
Other kinds of cookies perform essential functions in the modern web. Perhaps most importantly, *authentication cookies* are the most common method used by web servers to know whether the user is logged in or not, and which account they are logged in with. Without such a mechanism, the site would not know whether to send a page containing sensitive information, or require the user to authenticate themselves by logging in. The security of an authentication cookie generally depends on the security of the issuing website and the user's web browser, and on whether the cookie data is encrypted. Security vulnerabilities may allow a cookie's data to be read by a hacker, used to gain access to user data, or used to gain access (with the user's credentials) to the website to which the cookie belongs (see cross-site scripting and cross-site request forgery for examples).[57]

The tracking cookies, and especially third-party tracking cookies, are commonly used as ways to compile long-term records of individuals' browsing histories – a potential privacy concern that prompted European[58] and U.S. lawmakers to take action in 2011.[59][60] European law requires that all websites targeting European Union member states gain "informed consent" from users before storing non-essential cookies on their device.

Google Project Zero researcher Jann Horn describes ways cookies can be read by intermediaries, like Wi-Fi hotspot providers. He recommends to use the browser in incognito mode in such circumstances.[61]

Search engine

A *web search engine* or *Internet search engine* is a software system that is designed to carry out *web search* (*Internet search*), which means to search the World Wide Web in a systematic way for particular information specified in a web search query. The search results are generally presented in a line of results, often referred to as search engine results pages (SERPs). The information may be a mix of web pages, images, videos, infographics, articles, research papers and other types of files. Some search engines also mine data available in databases or open directories. Unlike web directories, which are maintained only by human editors, search engines also maintain real-time information by running an algorithm on a web crawler. Internet content that is not capable of being searched by a web search engine is generally described as the deep web.



The results of a search for the term "lunar eclipse" in a web-based image search engine

Deep web

The deep web,[62] *invisible web*,[63] or *hidden web*[64] are parts of the World Wide Web whose contents are not indexed by standard web search engines. The opposite term to the deep web is the surface web, which is accessible to anyone using the Internet.[65] Computer scientist Michael K. Bergman is credited with coining the term *deep web* in 2001 as a search indexing term.[66]

The content of the deep web is hidden behind HTTP forms,[67][68] and includes many very common uses such as web mail, online banking, and services that users must pay for, and which is protected by a paywall, such as video on demand, some online magazines and newspapers, among others.

The content of the deep web can be located and accessed by a direct URL or IP address, and may require a password or other security access past the public website page.

Web security

For criminals, the Web has become a venue to spread malware and engage in a range of cybercrimes, including identity theft, fraud, espionage and intelligence gathering.[69] Web-based vulnerabilities now outnumber traditional computer security concerns,[70][71] and as measured by Google, about one in ten web pages may contain malicious code.[72] Most web-based attacks take place on legitimate websites, and most, as measured by Sophos, are hosted in the United States, China and Russia.[73] The most common of all malware threats is SQL injection attacks against websites.[74] Through HTML and URIs, the Web was vulnerable to attacks like cross-site scripting (XSS) that came with the introduction of JavaScript[75] and were exacerbated to some degree by Web 2.0 and Ajax web design that favours the use of scripts.[76] Today by one estimate, 70% of all websites are open to XSS attacks on their users.[77] Phishing is another common threat to the Web. In February 2013, RSA (the security division of EMC) estimated the global losses from phishing at $1.5 billion in 2012.[78] Two of the well-known phishing methods are Covert Redirect and Open Redirect.

Proposed solutions vary. Large security companies like McAfee already design governance and compliance suites to meet post-9/11 regulations,[79] and some, like Finjan have recommended active real-time inspection of programming code and all content regardless of its source.[69] Some have argued that for enterprises to see Web security as a business opportunity rather than a cost centre,[80] while others call for "ubiquitous, always-on digital rights management" enforced in the infrastructure to replace the hundreds of companies that secure data and networks.[81] Jonathan Zittrain has said users sharing responsibility for computing safety is far preferable to locking down the Internet.[82]

Privacy

Every time a client requests a web page, the server can identify the request's IP address and usually logs it. Also, unless set not to do so, most web browsers record requested web pages in a viewable *history* feature, and usually cache much of the content locally. Unless the server-browser communication uses HTTPS encryption, web requests and responses travel in plain text across the Internet and can be viewed, recorded, and cached by intermediate systems. When a web page asks for, and the user supplies, personally identifiable information—such as their real name, address, e-mail address, etc.—web-based entities can associate current web traffic with that individual. If the website uses HTTP cookies, username and password authentication, or other tracking techniques, it can relate other web visits, before and after, to the identifiable information provided. In this way it is possible for a web-based organisation to develop and build a profile of the individual people who use its site or sites. It may be able to build a record for an individual that includes information about their leisure activities, their shopping interests, their profession, and other aspects of their demographic profile. These profiles are obviously of potential interest to marketeers, advertisers and others. Depending on the website's terms and conditions and the local laws that apply information from these profiles may be sold, shared, or passed to other organisations without the user being informed. For many ordinary people, this means little more than some unexpected e-mails in their in-box or some uncannily relevant advertising on a future web page. For others, it can mean that time spent indulging an unusua interest can result in a deluge of further targeted marketing that may be unwelcome. Law enforcement, counter terrorism, and espionage agencies can also identify target and track individuals based on their interests or proclivities on the Web.

Social networking sites try to get users to use their real names, interests, and locations, rather than pseudonyms, as their executives believe that this makes the social networking experience more engaging for users. On the other hand, uploaded photographs or unguarded statements can be identified to an individual, who may regret this exposure. Employers, schools, parents, and other relatives may be influenced by aspects of social networking profiles, such as text posts or digital photos, that the posting individual did not intend for these audiences. On-line bullies may make use of personal information to harass or stalk users. Modern social networking websites allow fine grained control of the privacy settings for each individual posting, but these can be complex and not easy to find or use, especially for beginners.[83] Photographs and videos posted onto websites have caused particular problems, as

they can add a person's face to an on-line profile. With modern and potential facial recognition technology, it may then be possible to relate that face with other, previously anonymous, images, events and scenarios that have been imaged elsewhere. Due to image caching, mirroring and copying, it is difficult to remove an image from the World Wide Web.

Standards

Web standards include many interdependent standards and specifications, some of which govern aspects of the Internet, not just the World Wide Web. Even when not web-focused, such standards directly or indirectly affect the development and administration of web sites and web services. Considerations include the interoperability, accessibility and usability of web pages and web sites.

Web standards, in the broader sense, consist of the following:

- *Recommendations* published by the World Wide Web Consortium (W3C)[84]
- "Living Standard" made by the Web Hypertext Application Technology Working Group (WHATWG)
- *Request for Comments* (RFC) documents published by the Internet Engineering Task Force (IETF)[85]
- *Standards* published by the International Organization for Standardization (ISO)[86]
- *Standards* published by Ecma International (formerly ECMA)[87]
- *The Unicode Standard* and various *Unicode Technical Reports* (UTRs) published by the Unicode Consortium[88]
- Name and number registries maintained by the Internet Assigned Numbers Authority (IANA)[89]

Web standards are not fixed sets of rules, but are a constantly evolving set of finalized technical specifications of web technologies.[90] Web standards are developed by standards organizations—groups of interested and often competing parties chartered with the task of standardization—not technologies developed and declared to be a standard by a single individual or company. It is crucial to distinguish those specifications that are under development from the ones that already reached the final development status (in case of W3C specifications, the highest maturity level).

Accessibility

There are methods for accessing the Web in alternative mediums and formats to facilitate use by individuals with disabilities. These disabilities may be visual, auditory, physical, speech-related, cognitive, neurological, or some combination. Accessibility features also help people with temporary disabilities, like a broken arm, or ageing users as their abilities change.[91] The Web receives information as well as providing information and interacting with society. The World Wide Web Consortium claims that it is essential that the Web be accessible, so it can provide equal access and equal opportunity to people with disabilities.[92] Tim Berners-Lee once noted, "The power of the Web is in its universality. Access by everyone regardless of disability is an essential aspect."[91] Many countries regulate web accessibility as a requirement for websites.[93] International co-operation in the W3C Web Accessibility Initiative led to simple guidelines that web content authors as well as software developers can use to make the Web accessible to persons who may or may not be using assistive technology.[91][94]

Internationalisation

The W3C Internationalisation Activity assures that web technology works in all languages, scripts, and cultures.[95] Beginning in 2004 or 2005, Unicode gained ground and eventually in December 2007 surpassed both ASCII and Western European as the Web's most frequently used character encoding.[96] Originally RFC 3986 allowed resources to be identified by URI in a subset of US-ASCII. RFC 3987 allows more characters—any character in the Universal Character Set—and now a resource can be identified by IRI in any language.[97]

Web caching

A web cache is a server computer located either on the public Internet, or within an enterprise that stores recently accessed web pages to improve response time for users when the same content is requested within a certain time after the original request. Most web browsers also implement a browser cache by writing recently obtained data to a local data storage device. HTTP requests by a

browser may ask only for data that has changed since the last access. Web pages and resources may contain expiration information to control caching to secure sensitive data, such as in online banking, or to facilitate frequently updated sites, such as news media. Even sites with highly dynamic content may permit basic resources to be refreshed only occasionally. Web site designers find it worthwhile to collate resources such as CSS data and JavaScript into a few site-wide files so that they can be cached efficiently. Enterprise firewalls often cache Web resources requested by one user for the benefit of many users. Some search engines store cached content of frequently accessed websites.

See also

- Electronic publishing
- Internet metaphors
- Internet security
- Lists of websites
- Prestel
- Streaming media
- Web development tools
- Web literacy
- World Wide Telecom Web

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- The first website
- Early archive of the first Web site
- Internet Statistics: Growth and Usage of the Web and the Internet
- Living Internet A comprehensive history of the Internet, including the World Wide Web
- Web Design and Development at Curlie
- World Wide Web Consortium (W3C)
- W3C Recommendations Reduce "World Wide Wait"
- World Wide Web Size Daily estimated size of the World Wide Web
- Antonio A. Casilli, Some Elements for a Sociology of Online Interactions
- The Erdős Webgraph Server offers weekly updated graph representation of a constantly increasing fraction of the WWW
- The 25th Anniversary of the World Wide Web is an animated video produced by USAID and TechChange which explores the role of the WWW in addressing extreme poverty

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